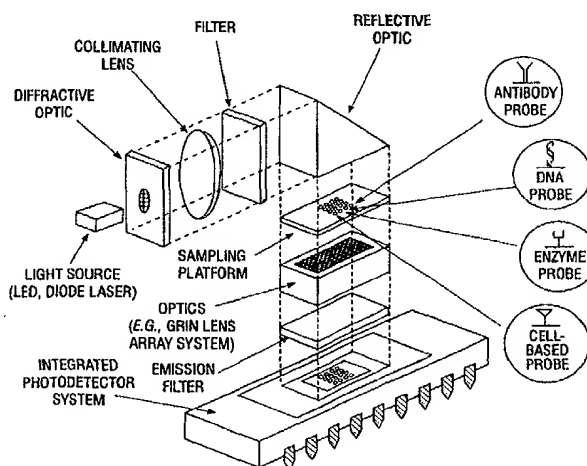


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(54) Title: MULTIFUNCTIONAL AND MULTISPECTRAL BIOSENSOR DEVICES AND METHODS OF USE**(57) Abstract**

Disclosed are advanced multifunctional biochip devices capable of specifically detecting and quantitating multiple biomolecular target compounds, such as polypeptides, polynucleotides, and other intracellular and extracellular biomolecules. In illustrative embodiments, the miniaturized multifunctional biosensor device comprises multiple biological sensing elements, excitation micro-lasers, a sampling waveguide equipped with optical fluorescence detectors, integrated electro-optics, a bio-telemetric radio frequency signal generator, and a plurality of molecular probes, all contained on a single integrated circuit, or "biochip". The biochip is suitable for multi-gene analysis, and multi-peptide detection, as well as simultaneous detection and quantitation of polynucleotide and polypeptide species using a single biochip device. Also disclosed are methods that permit rapid, large-scale, and cost-effective production of such biochip devices, as well as their use in the detection and quantitation of multiple species in a single mixed biological sample.